

NASA TECH BRIEF

Lewis Research Center



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Computer Programs for Handling Propulsion System Noise Data

Computer programs have been developed for the efficient handling of one-third-octave band noise data originating from the outdoor full-scale fan noise facility and the engine acoustic facility at the Lewis Research Center.

The last several years have seen a rapid rise in the level of research relating to the noise of aircraft propulsion systems. Various sources have been contributing to an increasing body of technical data. A significant volume among these data consists of the results of one-third-octave band analyses of the noise signatures of propulsion systems or components either from full-scale hardware or from models. Thorough analyses of these data are essential to the development of an understanding of the mechanisms of noise generation and to the development of noise prediction methods. Researchers using the full-scale fan and the engine acoustic facilities at the Lewis Research Center are among those generating and manipulating large volumes of one-third-octave band noise data. Several years ago, this situation was anticipated, and data handling practices were established to facilitate the manipulation and analyses of data at the user level. These practices center around a collection of computer programs which are used to process the data and a philosophy of data standardization and storage.

The key to the efficient retrieval and use of noise data at the working level lies in the user maintaining a compact punched card file of data, called "Working Data," and a family of programs and subroutines for manipulating those data. Utilization of archival data requires extensive computer interaction and program handling, particularly since the data to be retrieved and processed consist of repeat runs which must be averaged, corrected for measurement instrumentation response when necessary, and adjusted to standard-day conditions. The use of Working Data, which is one level removed from the archival data, permits rapid data access by persons not necessarily skilled in computer usage.

The one time use of a computer program (WODAG - Working Data Generation) generates both Working Data and other useful data listings as contrasted to repetitive and slow archival data retrieval. The printed output

includes tables of the original measured data, test-day and standard-day atmospheric absorptions, results of acoustic power calculations, directivity index, and perceived noise for the data extrapolated to various distances.

The use of Working Data permits convenient access to data in all its detail. Since the card data format is standardized and contains control information, one set may be read into computer storage by a simple call to a subroutine. Similar calls to other subroutines will generate Referred Arrays (data free of atmospheric absorption effects), produce extrapolations, generate perceived noise levels, etc. This modular approach to programming frees the user-programmer from concern over routine data handling tasks. The use of other main programs permits nonprogrammers also to conveniently access, extrapolate and analyze data starting with Working Data. Working Data (which consist of overall power level, power spectrum and directivity index rather than sound pressure levels) are useful in understanding mechanisms of noise generation, developing noise prediction methods, and executing empirical predictions. The Working Data and the associated programs also simplify the problems of user-programmers and nonprogrammers in accessing and manipulating the data, and increase the productivity and quality of data analyses.

Notes:

1. This program is written in FORTRAN IV for use on either an IBM 7094 or 360 computer.
2. Inquiries concerning these programs should be directed to:

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